A DESCRIPTIVE STUDY OF THE LIFE HISTORY STAGES OF THE DOG BITING LOUSE, TRICHODECTES CANIS (DEGEER) (MALLOPHAGA: TRICHODECTIDAE).

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Introduction.

The characteristics of nymphal instars of the dog biting louse, *Trichodectes canis* (DeGeer), are not as well known as are those of the adults. A brief survey of the literature has revealed very few studies of immature forms of Mallophaga. In this paper a study has been made of the morphological characteristics of the life history stages of the dog biting louse: the egg, three nymphal instars, and adult.

T. canis is found in the United States, Europe and Australia as an ectoparasite on the dog *Canis familiaris* (Linn.). McGregor (1917) describes what he believed to be a second species of biting louse, *T. floridanus,* found on the dog in the United States. Ewing (1936) reports that he has found some specimens from the dog which are intermediate in morphology between *T. canis* and *T. floridanus,* albeit nearer the former. The specimens studied in connection with this problem seem to occupy such a median position. It is suggested that the species *T. canis* and *T. floridanus* may be but morphological variations of the same species. However, demonstration of this statement remains to be presented.

Preserved biting lice originally removed from a dog in 1934 in Columbus, Ohio were bleached, dehydrated, cleared and then mounted in Clarite for study. The instars were distinguished on the basis of head capsule width measurements after the principle of Dyar (1890) and morphological characteristics. It was found found that the common ratio for the progression of head capsule width measurements of the dog biting louse was about 1.25. All descriptions were rechecked from material acquired from a dog in Columbus, Ohio (1948).

Descriptions of the Life History Stages.

Egg.

The egg (Fig. 7) is elongate and broadly oval and it is twice as long as it is wide. At the attached end it is somewhat truncated. Except for the lid the shell surface is smooth. The egg is fastened to a hair at its basal end by a cement substance along a straight

inner surface equal to from one-third to one-half the total length. The opposite end, from which the embryo emerges, is furnished with a circular cap, the operculum. This lid bears the micropylar apparatus which consists of a number of papillae arising from the peak of the operculum. The papillae are inclined towards the center and each is narrower at its base than it is distally. A number of transverse folds are present on each papilla. The spaces between adjacent papillae are invested with chorion.

The average length of the egg was 0.83 mm. and the average width at the widest part was 0.42 mm.

First Nymphal Instar.

The head of the first instar nymph (Fig. 8) is slightly wider than it is long and the anterior margin is semicircular with a tendency toward being truncated anteriorly rather than indented. In front of each antenna the anterior margin is produced into prominent trabecula-like processes (Fig. 4). The antennal sinuses are distinct but not deep. Behind the bases of the antennae are the distinct ocular projections. Immediately behind the eyes, the temporal margins commence to converge and meet the occipital margin with an obtuse curvature. The occipital margin is but slightly convex for the entire width of the prothorax. The anterior margin is furnished with several hairs. A short hair is present at the base of each trabecula just over which a longer hair arises. One short hair arises just mesad of each eye and one behind this. Several short hairs are present along the posterior margin with one long hair arising near the temporal angle.

The basal segment of the antenna (Fig. 1) is but slightly wider than either of the remaining two segments. The third segment is nearly equal in length to the other two combined. There are two small circular sensoria close together on the ventral surface of the third segment.

The thorax is slightly narrower than the head and more than twice as wide as it is long. The prothorax is broad, with the median portion of the hind margin slightly concave. A pair of protruding spiracles are borne, one along each obliquely rounded lateral margin. There is a long bristle on each side of the pronotum near the hind margin midway between a median line and the lateral border. The sides of the pterothorax (the united mesothorax and metathorax) converge posteriorly and the posterior margin is shallowly concave. There is one short bristle at each anterior lateral angle. Mesad of each lateral border a long bristle arises.

A median pair of short bristles is located along the posterior margin.

The first pair of legs is shorter than the other two pairs. The fore coxae lie close to one another in the center. The tibiae of the second and third pairs of legs are longer than those of the first pair. All tarsi are two-segmented. The claws of the prothoracic legs are stout while the claws of the other legs are long and slender. In addition to several short bristles on each leg segment, the tibiae are furnished with apical spurs.

The abdomen is widely oval in outline. The terminal segment is deeply emarginate medially. Two transverse rows of hairs are present medially on the first segment which is longer than the succeeding segments. The anterior row consists of two hairs and the posterior row of about six hairs. A bristle arises from each posterior lateral angle and anterior to this another bristle arises. The second to the sixth segments (inclusive) are each furnished with a transverse row of about six hairs with the median pair of hairs long. The hairs are arranged one behind the other to form four distinct longitudinal columns. A long bristle arises from each posterior lateral angle of these segments. On segment VII a pair of long hairs originates, one from each posterior lateral angle. On either side of the emargination of the terminal segment about two short hairs arise.

The average total length of the first nymphal instar was 0.76 mm. The average length of the head was 0.26 mm.; the thorax, 0.11 mm.; the abdomen, 0.39 mm. The average width at the widest part of the head was 0.32 mm.; the thorax, 0.30 mm.; the abdomen, 0.42 mm.

Second Nymphal Instar.

In the second nymphal instar (Fig. 9) a small median portion of the anterior margin of the head exhibits a very slight emargination. The antennal sinuses are somewhat deeper and the ocular projections are prominent (Fig. 5). A somewhat similar distribution of the marginal hairs on the head in this instar is evident as compared with instar I. The antennae (Fig. 2) are similar to those of the first instar.

The thorax is narrower than the head at the cervical joint and it is about three times as wide as it is long. An additional bristle has appeared on the pronotum mesad of each spiracle. Along the lateral border of the pterothorax four to five bristles are present. A transverse row of four bristles arises from the dorsum near the hind margin.

The abdominal segmentation remains unchanged. Each of the abdominal segments II to VII (inclusive) now bears a pair of spiracles, one near each lateral ventral border. The number of bristles on the abdominal tergites have increased. Segment I bears two transverse rows of hairs. An anterior median series consists of two to four hairs. A posterior series of about fourteen hairs is distributed in a median group of four to six hairs and two lateral groups of five to six bristles each. Along each lateral border is present a bristle anterior to the one arising from the posterior lateral angle. The chaetotaxy of segments II to V (inclusive) is similar to the hind series of hairs on segment I. Segment VI bears a transverse row of about eight bristles divided into two groups of four hairs each. Only two hairs make up the lateral groups of segment VII. The terminal segment bears a transverse series of four short bristles. An over-all view of the dorsal abdominal chaetotaxy shows the arrangement of hairs in two lateral longitudinal columns and one median column.

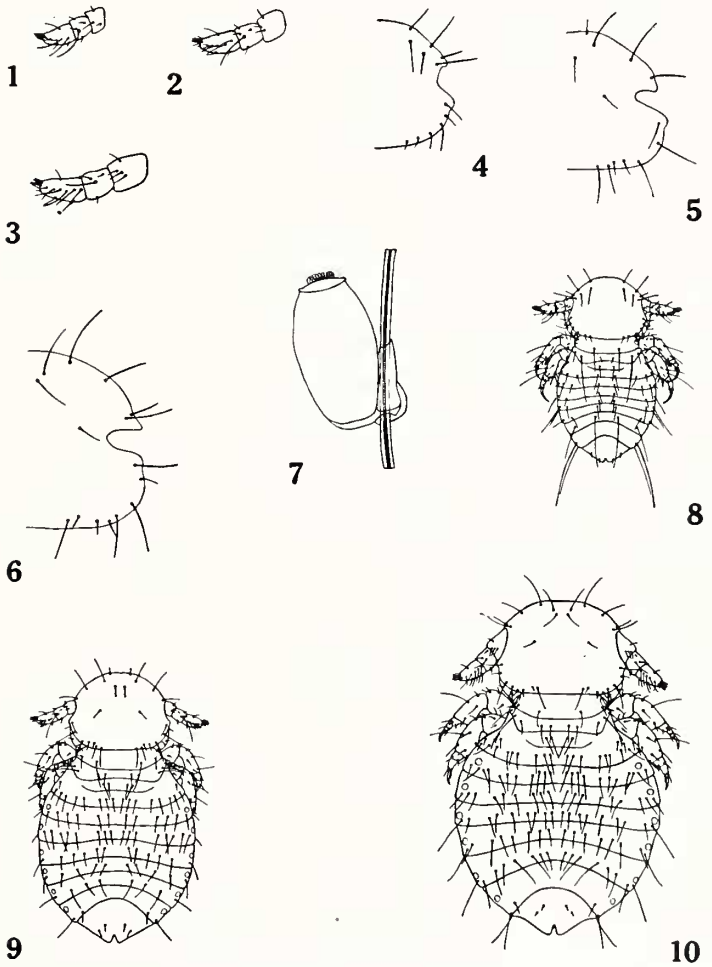
The average total length of the second nymphal instar was 1.09 mm. The average length of the head was 0.31 mm.; the thorax, 0.14 mm.; the abdomen, 0.64 mm. The average width at the widest part of the head was 0.41 mm.; the thorax, 0.42 mm.; the abdomen, 0.63 mm.

Third Nymphal Instar.

The nymph of the third stadium (Fig. 10) presents a basal antennal segment as wide as it is long (Fig. 3). The length and width of the second antennal segment are also equal but this segment is smaller in size than the first segment. Antennal segments 1 and 2 combined are one-quarter again as long as the third segment. Several hairs are present dorsally on the head (Fig. 6) as well as marginally.

The hind border of the pterothorax is now margined by a transverse row of about six bristles.

Additional bristles on the abdomen are present as follows: Segment I bears an anterior transverse row of about six bristles. Behind this arises a transverse row of about eight median bristles and a group of three bristles on each side of these. Each lateral border is furnished with a cluster of about ten bristles distributed in four ill-defined transverse rows. Segments II to VI (inclusive) each bear a transverse row of six to eight median bristles with a group of three bristles on either side of this median group. The number of lateral bristles on nymphs of the third stadium are not



EXPLANATION OF PLATE V

FIG. 1. Antenna, first nymphal instar, dorsal aspect. FIG. 2. Antenna, second nymphal instar, dorsal aspect. FIG. 3. Antenna, third nymphal instar, dorsal aspect. FIG. 4. Right half of head, antenna removed, first nymphal instar, dorsal aspect. FIG. 5. Right half of head, antenna removed, second nymphal instar, dorsal aspect. FIG. 6. Right half of head, antenna removed, third nymphal instar, dorsal aspect. FIG. 7. Egg. FIG. 8. First nymphal instar, dorsal aspect. FIG. 9. Second nymphal instar, dorsal aspect. FIG. 10. Third nymphal instar, dorsal aspect.

constant from segment to segment. As many as five setae are present laterally on segment II and the number found on the succeeding segments of the abdomen decreases consecutively until segment VI from which only one or two lateral bristles arise. Four bristles are present on segment VII, two at each lateral posterior corner. Two pairs of very short bristles are present on the terminal segment.

The average total length of the third nymphal instar was 1.35 mm. The average length of the head was 0.36 mm.; the thorax, 0.15 mm.; the abdomen, 0.84 mm. The average width at the widest part of the head was 0.52 mm., the thorax, 0.45 mm.; the abdomen, 0.81 mm.

Adult.

The female (Fig. 17) is larger than the male (Fig. 16). The head of both the male (Fig. 11) and the female (Fig. 12) is one and one-third times as wide as it is long. The median portion of the anterior margin of the head is but slightly emarginate. In the female the ocular projections are more prominent than they are in the male. Several hairs are present dorsally and along the anterior, temporal and occipital margins.

From deep antennal sinuses arise the antennae, different in the two sexes. In the female the antennal segments, in order of decreasing length, are 3, 1 and 2 (Fig. 14). The second and terminal segments are of about equal diameter but the basal segment is one-quarter again as wide as either of the other segments. The segments are joined one to another in a more or less straight line.

In the male the antennae (Fig. 13) are longer than in the female. The basal antennal segment is more than two and one-half times wider than either of the other two segments. The second segment is but slightly wider than the third segment. The basal segment is almost twice as long as the second segment. Intermediate in length between the first and second segments is the third segment. The third segment terminates in a couple of heavy, broad and short spurs borne on the inner surface. Just basal to the spurs is a toothlike projection. Another projection arises between antennal segments 2 and 3. Whereas in the female the antennae were straight, in the male the antennae curve backward and inward.

The concave hind border of the male pterothorax bears about four bristles while in the female eight may be present.

The outline of the terminal eighth segment is different in the two sexes. The gonopods of the female project beyond the end

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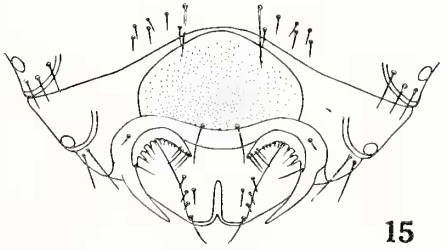

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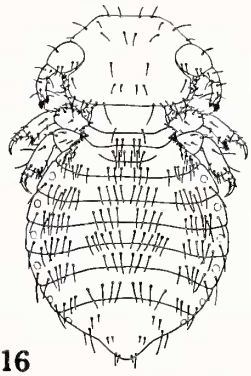

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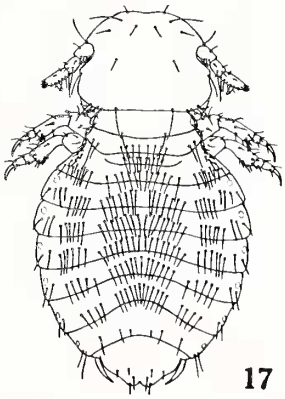

17

EXPLANATION OF PLATE VI

FIG. 11. Right half of head, antenna removed, male, dorsal aspect. FIG. 12. Right half of head, antenna removed, female, dorsal aspect. FIG. 13. Antenna, male, dorsal aspect. FIG. 14. Antenna, female, dorsal aspect. FIG. 15. Terminal abdominal segments, female, ventral aspect. FIG. 16. Adult, male, dorsal aspect. FIG. 17. Adult, female, dorsal aspect.

of the abdomen on either side of a deep median emargination. They cover the sternal surface and lie transversely across the end of the abdomen (Fig. 15). The male abdomen tapers to the anal extremity at which point the copulatory perputial sac is extruded. The suture joining segments VII and VIII is apparently absent in the adult male.

The dorsal chaetotaxy of the two sexes differ in that more hairs are present on the female abdomen. The first segment of the female abdomen is furnished with a transverse series of about ten bristles at its anterior margin medially. Along the posterior margin of the same segment a similar median group of hairs arises on each side of which there are about four more hairs. As many as ten hairs may be found along the lateral margins. Segments II to VI (inclusive) each bear a transverse row of about twenty-four to thirty-six hairs. Segment VII bears about ten hairs. Arising from the terminal segment are a central cluster of four dorsal bristles and a transverse series of four bristles.

A characteristic of the male abdominal setae is the separation of the median group of hairs on each of the first three or four segments into two groups. An anterior series of about seven hairs is is present on segment I behind which a similar group arises. On each side of the posterior group are four bristles. Along the lateral borders are clusters of ten to sixteen hairs. Segments II to VI (inclusive) bear transverse series of about sixteen to twenty-four dorsal bristles with about six bristles present on segment VII. The terminal segment bears a terminal cluster of several hairs and a transverse series of four hairs.

The average total length of the male was 1.50 mm.; the female, 1.68 mm. In the male, the average length of the head was 0.42 mm.; the thorax, 0.16 mm.; the abdomen, 0.92 mm.; the average width at the widest part of the head was 0.58 mm.; the thorax, 0.49 mm.; the abdomen, 0.86 mm. In the female, the average length of the head was 0.46 mm.; the thorax, 0.16 mm.; the abdomen, 1.06 mm.; the average width at the widest part of the head was 0.63 mm; the thorax, 0.55 mm.; the abdomen, 1.00 mm.

Summary and Discussion.

In a study of the life history stages of the dog biting louse, *Trichodectes canis* (DeGeer), the following occurrences are recognized:

1. The abdomen of all immature instars of the louse and of the adult female is eight-segmented while the adult male abdomen is seven-segmented. However, the first segment is twice as long as

any of the remaining segments. In addition, the first abdominal segment bears two transverse rows of dorsal bristles whereas the other segments bear only one transverse row. Therefore, the apparent first abdominal segment is the true first and second abdominal segments which have fused prior to hatching. In the male, the apparent seventh segment is the true eighth and ninth segments, fusion of the apparent seventh and eighth segments taking place in the third molt.

2. On eclosion from the egg the nymph has a single pair of spiracles which is located on the prothorax. The appearance of a pair of spiracles on each of the abdominal segments II to VII (inclusive) occurs in the first molt.

3. There is an increase in the number of bristles on each instar after molting. This is especially true of the hairs on the abdomen. Each median transverse row of hairs on the abdominal tergites is continuous in all instars except in the adult male where the first three or four rows are separated into two groups.

4. The sex of immature instars of the louse is not distinguishable on the basis of external secondary sexual characteristics. The male and female copulatory apparatus are acquired in the final molt. At this same ecdysis, while the female antennae remain relatively unaltered, the male antennae undergo two important changes. First, the basal antennal segment swells greatly in size. Secondly, the terminal antennal segment acquires a pair of distal spurs plus two cuticular denticles. These morphological modifications probably enable the male to grasp the female during copulation.

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